MEDICAL PROCEEDINGS

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REDAKSIONEEL · EDITORIAL

DIE WELSYN VAN DIE PASIËNT ONDER ANESTESIE

Vooringenomendheid met die voorkoming van sterfgevalle gedurende prosesse wat met anestesie geassosieer is, behoort nie iets te oorskadu wat van ewe groot belang is nie—nl. die voorkoming van 'n nuttelose morbiditeit wat op algemene anestesie kan volg.

Fisiese trauma kan die gevolg wees van onnodig swaar apparaat en van onverskillige maneuwers onderwyl die pasiënt hulpeloos en nie in staat is om vir homself te sorg nie. Dis moontlik om hierdie gevare te vermy, maar dit is ook van belang om te verseker dat die anestesie-apparaat nie op sigself 'n ekstra, verraderlike toksiese bydrae tot die proses lewer nie. Dit kan maklik volg op die gebruik van apparaat wat die dooie ruimte (en ook die weerstand teen die stroom van gasse) vermeerder in die respirasie-kringloop waarby die hulpelose pasiënt ingesluit is.

Een van die allerbelangrikste komplikasies is die gevolg van die feitlike vergifting van die pasiënt deur 'n versameling van koolDioksied—'n gebeurlikheid wat baie maklik veronagsaam kan word en wat die oorsaak kan wees van, of kan bydra tot talle gevolge van anestesie, insluitende na-anestetiese instorting.

Die niksvermoedende kan moontlik die onwenslike newe-effekte van 'n anestetiese middel die skuld gee terwyl dit inderwaarheid te wyte kan wees aan die tegniek van anestesie wat aanleiding kan gee tot steurings wat voorkom kan word en voorkom moet word deur die gebruik van apparaat wat ontwerp is om die pasiënt se dooie ruimte so na aan die fisiologiese perke as moontlik te hou. Hierdie pre-

THE WELL-BEING OF THE ANAESTHETIZED PATIENT

Preoccupation with avoiding deaths during procedures associated with anaesthesia should not obscure the equal importance of preventing the needless morbidity which may follow general anaesthesia.

Physical trauma may result from unnecessarily heavy apparatus and from careless manoeuvres while the patient is helpless and unable to fend for himself. These dangers can be avoided but it is also important to ensure that the anaesthetic apparatus does not itself make an additional, insidious toxic contribution to the procedure. This may well result from the use of apparatus which increases the dead space (and the resistance to the flow of gases) in the respiratory circuit in which the helpless patient is included.

One of the most important complications results from the virtual poisoning of the patient by an accumulation of carbon dioxide—an event which may easily be overlooked and which may account for or contribute to many post-anaesthetic sequelae, including post-anaesthetic collapse.

The unsuspecting may blame on an anaesthetic drug undesirable side effects which may well, in fact, be due to the technique of anaesthesia, resulting in disturbances which should and could be prevented by using apparatus designed to keep the patient's dead space as close to the physiological limits as possible. This preventive anaesthetic technique is more rational than plying the patient with

ventiewe anestetiese tegniek is meer rasioneel as om die pasiënt te behandel met teenmiddels wat, op hul beurt, alleen die komplikasies verder kan vergroot.

Elders in hierdie uitgawe publiseer ons 'n verhandeling van dr. H. H. Samson waarin hy 'n beskrywing gee van nuwighede in anestetiese apparaat, ontwerp vir die uitskakeling van sommige van die meganiese defekte (inherent in standaard-toerusting) wat heel waarskynlik die oorsaak is van baie van die naanestetiese morbiditeit omdat hulle die fundamentele fisiologiese beginsels van respirasie skend. Die skrywer lê op heel rasionele wyse klem daarop dat daar nie wesenlik tot die pasiënt se belemmerings bygedra moet word nie. Die nuwighede is ontwerp om die kleinste moontlike fisiese afstand tussen die pasiënt en die vlugtige narkose middel te plaas om sodoende optimale respirasie-toestande te skep met die gevolg dat daar die mins moontlike kans vir die ontwikkeling van komplikasies bestaan. Daarbenewens is dr. Samson se gebruik van plastiese stof in die plek van metaal nie alleen 'n doeltreffende verbetering op die bestaande materiaal nie, maar verminder dit ook die gevaar van trauma, byvoorbeeld in die pasiënt se gesig, en daarby maak dit die gewig van die apparaat wat die narkotiseur moet vervoer aansienlik ligter.

Die higiëne van die genarkotiseerde pasiënt behoort eweneens vir die praktisyn in bevel 'n ernstige aangeleentheid te wees. Die gebruik van natriumkalk-trommels oor lang tydperke vir talle pasiënte moet op higiëniese gronde gekritiseer word. Dr. Samson vestig die aandag op die ondoeltreffendheid van die trommeltjie as 'n wapen teen bakterieë. Dit is in die belang van iedere pasiënt om te verseker dat hy van 'n skoon en nuutgepakte trommeltjie voorsien word. Dit vereis die roetienegebruik van klein en doeltreffende liewer as groot ofskoon goedkoop en tydbesparende natriumkalk-houers.

Die veranderings in anestetiese apparaat wat deur dr. Samson in hierdie uitgawe beskryf word, kom neer op 'n aanneemlike toepassing van gesonde fisiologiese en profilaktiese beginsels. Dit lyk onvermydelik dat die mediese beroep dwarsdeur die wêreld dié veranderings weens hul wetenskaplike verdienstes in die algemeen sal aanvaar.

antidotes which may only, in their turn, increase the complications further.

Elsewhere in this issue we publish a paper by Dr. H. H. Samson in which the author describes innovations in anaesthetic apparatus designed to overcome some of the mechanical defects (inherent in standard equipment) which are probably the cause of much post-anaesthetic morbidity because they violate fundamental physiological principles of respiration. The author's main emphasis is a rational insistence on not adding materially to the patient's handicaps. The innovations are designed to place the minimum possible physical distance between the patient and the volatile anaesthetic, thus creating optimal respiratory conditions with consequently the least chance for the development of complications. Moreover, Dr. Samson's use of plastics in place of metal is not only an efficient improvement on existing materials, but also lessens the risk of trauma, e.g. to the patient's face, and substantially lightens the load of apparatus which the anaesthetist may have to transport.

The hygiene of the anaesthetized patient should equally be a matter for concern to the practitioner in attendance. The use of soda lime canisters for prolonged periods for numerous patients in succession is to be criticized on hygienic grounds. Dr. Samson draws attention to the inefficiency of the canister as a bactericidal weapon. It is in the interests of each patient to ensure that he is provided with a clean and freshly charged canister. This requires the routine employment of small and efficient rather than large, though cheap and time-saving, soda lime containers.

The modifications in anaesthetic apparatus described by Dr. Samson in this issue constitute an attractive application of sound physiological and prophylactic principles. Because of their scientific merit, their general adoption by the medical profession throughout the world seems inevitable.

ABSTRACTS

CEREBRAL DYSFUNCTION: A REVIEW

This is a review of recent developments in neuropharmacology and neurophysiology. The subject of chemical mediators in the central nervous system is discussed, with the conclusion that probably most of the currently available ataractics, 'psychic energizers' and psychotomimetics act upon or substitute for the neurohumoral mediators and thereby alter cerebral energy utilization.

[Fazekas, J. F. (July 1958): *Pathologic Physiology of Cerebral Dysfunction,* Amer. J. Med., **25,** 89.]

DIABETES MELLITUS COMPLICATIONS

A study of vascular complications in a series of 137 cases of long-term diabetes mellitus is presented. In 30 cases the duration of diabetes exceeded 25 years. Thirty-eight cases of the total series were found to be free of retinopathy, hypertension and albuminuria. The degree of control appears to be a significant factor in the development of vascular complications in long-term diabetes mellitus.

[Paul, J. T. *et al.* (July 1958): *Complications of Long-Term Diabetes Mellitus,* Ann. Int. Med., **49,** 142.]

DEFECTS IN ANAESTHETIC EQUIPMENT

RADICAL IMPROVEMENTS

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The term 'general anaesthesia' does not convey the pathological nature of the state which it signifies. It is a century-old euphemism which should be discarded in favour of 'anaesthetic coma,' and the 'anaesthetic agents' used to produce the state should be labelled 'narcotics.'

Coma produced by narcotics is potentially more dangerous than a comparable state, hypoglycaemic coma, artificially induced to effect convulsions, and its management is far more difficult. It is relatively easy, and requires no skill, to alter the blood chemistry sufficiently to produce one or two convulsions, and then to restore the blood sugar to a safe level.

When an anaesthetist undertakes to administer an anaesthetic he is faced with a host of serious problems. Not only has he to meet the demands of different types of surgery and surgeons, but he must also prevent the state he creates from becoming uncontrolable. From start to finish, general anaesthesia is fraught with danger. Complications such as laryngeal spasm and cardiac arrest may supervene in a matter of seconds. Treatment of these is of the greatest urgency, requiring skill as well as courage. If the patient suffers from a medical condition as well, the anaesthetic demands may be more exacting than the surgical. All in all, the anaesthetist has heavier responsibilities than the doctor who is called to treat an already established medical condition, and who is seldom held culpable for an unfavourable outcome.

Many of the difficulties confronting the anaesthetist are inherent in standard equipment, *especially for endotracheal administration*, and this article sets out a description of improved equipment whereby difficulties can be minimized or obviated. As a result, mortality and morbidity arising from anaesthetic coma can be appreciably reduced, and recovery accelerated. With the improved equipment, these results can be achieved with familiar narcotics.

HAZARDS OF ANAESTHETIC COMA

In the modern operating theatre the well-being of the surgical team is assured. The air is changed frequently, so that there is no noticeable increase in the carbon dioxide content of the atmosphere, room temperature or humidity. The unconscious patient, however, cannot fend for himself. Though he may initially resist inhaling vapours which are too strong, he does not rebel against an insidious but serious rise in the temperature or humidity of the inspired gases. Much post-operative discomfort, such as headache and nausea, is probably due to these factors. The heat generated by a carbon dioxide absorber, especially when injudiciously used, may be an aggravating factor.

The unconscious patient is subjected not only to these conditions but also to the ill effects of the narcotic. Most narcotics are gravely toxic in high concentration, and are liable to tamper with the vital function of respiration.

HISTORICAL REVIEW OF ANAESTHETIC METHODS

In the days of the 'rag and bottle' or 'open' method, most of the expired CO_2 (including the concentration needed to stimulate and maintain adequate ventilation) was lost. It went unhindered into the ambient atmosphere. Without its stimulus, it was difficult to ensure a depth of respiration which would convey enough of the narcotic to the blood stream, especially if the narcotic was only mildly potent. Hence the open method gave way to the semi-open; the face mask was covered with towels so that the concentration of the narcotic in the inspired air was increased.

The introduction of a re-breathing bag with an expiratory valve followed logically. This semi-closed technique greatly facilitated anaesthesia and was, incidentally, more economical.

Finally the closed method was evolved in an endeavour to control further the amount and proportion of the gases respired. As the danger of CO_2 accumulation became apparent, the soda lime canister became an important part of the apparatus. In an attempt to exclude any posibility of CO_2 accumulation in the re-breathing bag, the uni-directional valve

was evolved, permitting what amounted to the open method. It was a great advance on the 'rag and bottle' method, as the gases (including oxygen) could now be given under pressure if required.

The closed method utilizes a soda lime canister. If semi-closed, the use of an absorber is optional. Both these methods make use of some sort of expiratory valve, of which the standard type, most commonly used, is the Heidbrink valve. It has a metal spring which exerts pressure on a disc covering an aperture. The tension of the spring can be regulated to allow varying amounts of gas, or none at all, to escape. *When respiration is spontaneous, the alveoli must overcome the resistance of the spring.* When respiration is controlled, the anaesthetist's hand compresses the re-breathing bag and forces the gases out through the valve.

Each method has its protagonists. Although one method may not be as dangerous as another, the safety of any one method depends on many factors, including the nature, site and extent of the operation, the health and compensating power of the patient,[1] and the experience and skill of the anaesthetist. In general, however, the most frequently used technique to-day is the semi-closed, with or without a carbon dioxide absorber. It is popular throughout the world, in hospitals and in private practice, with specialist and non-specialist anaesthetists. It is for this method, whether with or without an absorber, and whether respiration is spontaneous or controlled, that standard equipment is unsuitable.

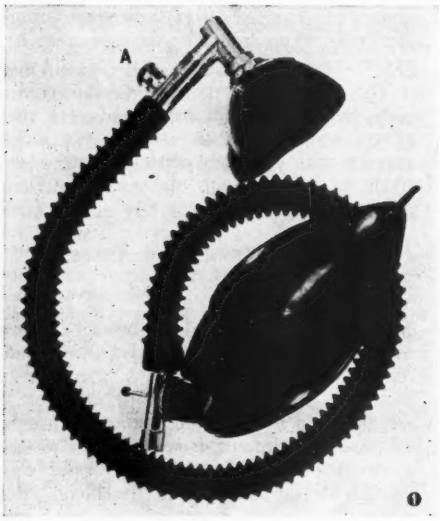


Fig. 1: Standard equipment.
A: The Heidbrink valve.

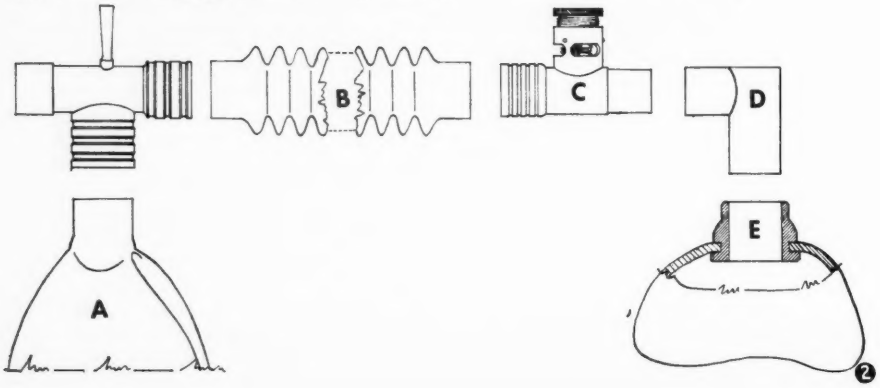


Fig. 2: Diagram of Fig. 1.
A: The re-breathing bag.
B: The corrugated tubing.
C: The valve.
D: The angle piece.
E: The chimney of the face piece.

DEFECTS IN STANDARD EQUIPMENT

1. *For the Semi-Closed Method Without an Absorber.* The defects are related to:

(*a*) Resistance;
(*b*) Dead space;
(*c*) Pressure trauma; and
(*d*) Air-conditioning.

(*a*) *Resistance.* There is excessive unphysiological resistance to the expired gases. Paradoxically, this is largely due to the so-called expiratory valve, an obvious misnomer (A in Fig. 1). Such a valve, when 'open,' is supposed to offer minimal resistance to the excape of expired gases during spontaneous breathing. Most of the expired gases are assumed to escape through the open valve, the remainder passing on to the bag. But the resistance of such a valve is often considerable. As much as 10 c.c. of water pressure may be necessary to overcome it. Only when the pressure within the apparatus rises to a certain minimum is the resistance overcome and gas allowed to escape.

Resistance is aggravated by incorrect placing of the valve. In standard equipment (C in Fig. 2), it is placed at a right angle to the expiratory stream, instead of in direct line. In addition, the lumen of the valve is smaller than that of the tubing leading to the bag. Hence the gases tend to take the line of least resistance and pass to the bag, even when the valve is completely open; in fact, even when the disc is removed!

A further defect is the tendency for the valve to 'stick,' when the metal rod attached to the disc jams in the turret in which the rod moves like a piston. Often a pin is then used as a makeshift to prevent jamming. Such improvisations are undesirable and even dangerous.

The resistance of the valve can be increased so that more of the gases are directed to the bag but, even when 'open,' it corresponds to the crude exhaust of an engine. It is clearly unsuited to the delicate mechanism of respiration, involving sensitive alveoli. In infants and young children it constitutes a grave hazard, as the small tidal volume is unable to make much impression even on the 'open' valve.

Some bags receive the fresh gases through a special inlet. Unless a uni-directional valve is used, this increases the resistance to the exhaled gases. The resistance is greater during controlled respiration, since the expired gases pass *in toto* to the bag. Finally, where it is necessary for the anaesthetist to keep his distance from the patient, the interposed tubing constitutes further resistance.

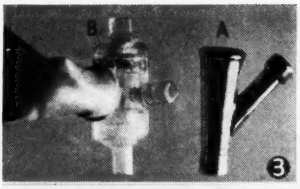
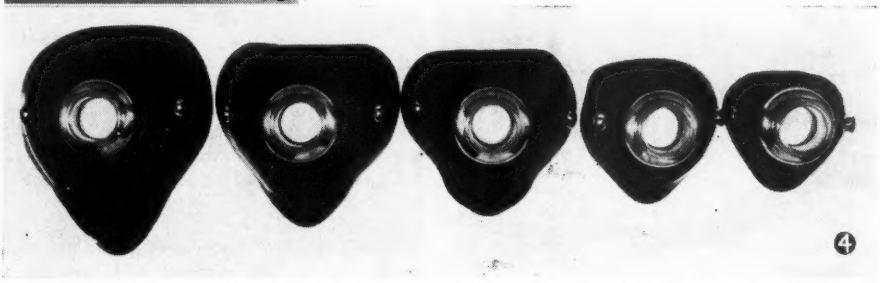


Fig. 3: The device compared with an Ayre's tube for size.

Fig. 4: Dead space in the 5 chimneys.



While these resistances may not produce demonstrable ill effects in healthy adults who are able to compensate,[1] they hamper smooth anaesthesia and are potentially dangerous in the very young and in the poor-risk subject. Infants and young children often struggle violently against a feeling of intolerable oppression, and it is more than probable that harmful reflexes are set up in the alveoli.

This feeling of oppression is characteristic of anaesthesia administered with standard dental apparatus. The patient is expected to expire through his nostrils against a resistance

comprising several feet of rubber tubing (leading to the bag), and the current of gases delivered under pressure from the machine.

Resistance to expiration is nowhere more marked than in endotracheal administration, where the passages are rendered relatively airtight by the anaesthetist and where, in addition to the resistance of the valve, the passive recoil of expiration has to contend with a direct jet of gases entering through a narrow tube and narrow connexions. The consequent mortality and morbidity in infants who require endotracheal administration is generally admitted.

To overcome the resistance of the valve, various appliances are used. They allow the expired gases to pass unhindered to the ambient atmosphere (A in Fig. 3). During inspiration, air is sucked in through the expiratory vent, diluting the narcotic and therefore necessitating a high flow rate and high concentration. In an emergency, provision for the administration of oxygen is often lacking or inadequate. In general, the method is potentially dangerous and considerable skill is required to ensure success.

(*b*) *Dead Space.* The dead space in standard equipment is excessive.[2] It is present in the various accessories: angle pieces, face pieces, connexions like the endotracheal adapter, and rubber tubing. Dead space may be a critical factor in infants, young children and poor-risk patients in general. The angle piece (D in Fig. 2) may account for as much as 18 c.c. of redundant dead space. If it does not fit well down into the chimney of the face piece (E in Fig. 2), the chimney will account for a further amount.

Though face pieces are made in different sizes for different age groups, even the best-fitting face piece contains as much as 30 c.c. of dead space, and some more than 100 c.c.[3] No real attempt has been made to reduce the size of the chimney for younger subjects. In a popular design, the same size of chimney is provided for the 5 available sizes of face piece, and holds more than 9 c.c. of dead space (Fig. 4).

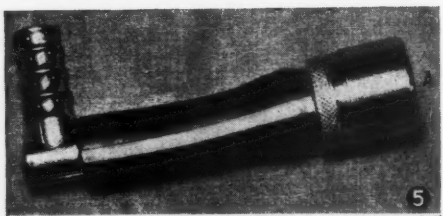
The connexion between the angle piece and the valve sometimes holds a further 7 c.c. of dead space (Fig. 2). The endotracheal adapter (A in Fig. 5) may contain as much as 6 c.c. in its bowl.

When it is necessary to place the valve at a distance from the patient, the interposed tubing holds several hundred c.c. of dead space[3] (Fig. 6).

Unphysiological dead space created by standard accessories is relatively enormous for the very young patient. As a result, very little of the fresh incoming gases reaches the respiratory passage of the patient who, to a large extent, rebreathes his expired gases. To maintain anaesthesia, dangerously high concentrations of narcotic (often powerful and far beyond the usual requirements of robust adults) are used, because of the alleged higher metabolic rate of infants. *The metabolic rate of an infant who perhaps cannot hold up its head is not high.* Even in older children, who definitely have a high metabolic rate, anaesthesia can be administered with ease by the 'rag and bottle' method, so that the metabolic rate does not appear to be a valid factor.

(*c*) *Pressure Trauma.* The well-being of the patient is often upset by the weight of metal connexions which necessitate heavy face pieces and strong retaining straps. Many patients complain of sore faces or swollen eyelids on recovery.

(*d*) *Air Conditioning.* One of the advantages of the open method is that the patient receives a maximum of cool, fresh gases. With the semi-closed method, it is inevitable that this advantage must be sacrificed to some extent, but not to the extent which occurs with



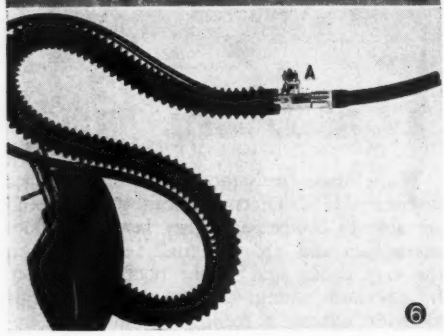


Fig. 5: Endotracheal connexion attached to the metal endotracheal adapter by means of tubing.
A: The bowl of the adapter.

Fig. 6: Standard equipment. The inlet and the expiratory valve in one unit.
A: The unit.

controlled respiration and standard equipment. With such equipment, the inlet and the outlet are adjacent, contained in a single unit (A in Fig. 6). When the bag is compressed, much of the fresh gases is forced out through the valve. This drawback is aggravated when an absorber is used, especially with a to-and-fro circuit, as will be shown later.

INNOVATIONS SUGGESTED

The main improvements in equipment are a device for endotracheal administration (Fig. 7) which can also be used with a face piece or dental nose piece, and accessories, all made of 'Perspex' and embodying the following features:

1. An *expiratory valve,* devoid of any spring (A in Fig. 7). It consists of a coloured Perspex disc covering an aperture which alternately

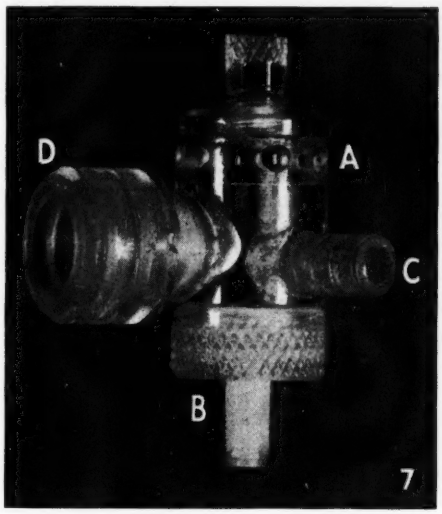


Fig. 7: The Device.
A: The valve.
B: The vertical limb.
C: The inlet for the gases.
D: The attachment for the re-breathing bag.

opens and shuts with expiration and inspiration in response to tidal volumes as low as 4–5 c.c. There is no *measureable resistance* to the escape of gases through this valve, which *functions in any position* (e.g. on its side or upside down). It is placed in direct line with the expiratory stream. Its aperture is equal to the lumen of the expiratory channel. It is housed in a Perspex cage which allows the disc to rock without the possibility of jamming, and which ensures that the disc is not lost or mislaid. It can be adjusted by a screw to regulate re-breathing as required.

2. The *lumen of the vertical limb* is wide enough to accommodate the flow of gases without causing appreciable resistance even to

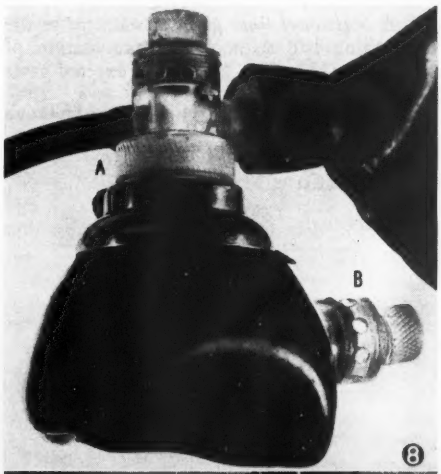


Fig. 8: The device connected to a face piece by a Perspex bush.
A: The bush.
B: An expiratory valve in the face piece.

Fig. 9: The device connected direct to the endotracheal tube without a connexion or adapter.

volumes far in excess of the average tidal volumes. The lower end of the limb is tapered to fit an endotracheal adapter (B in Fig. 7), or a Perspex bush which connects the device to a standard face piece (A in Fig. 8) or a dental nose piece. In the latest model, however, the lower end fits directly into the endotracheal tube without an intervening adapter (Fig. 9).

3. An *inlet for fresh gases* is placed near the lower end of the vertical limb (C in Fig. 7). In the device for infants, the incoming gases enter through an extra canal in the wall

of the vertical limb (X in Fig. 11). They strike a peripheral platform in the endotracheal adapter (A in Fig. 11), producing an eddy which tends to reduce the dispersal of the narcotic through the widely open valve. The gases are thus deflected across the narrow aperture of the adapter and are more readily available during inspiration.

4. A *horizontal limb* gives attachment to the re-breathing bag without the intervention of any tubing (D in Fig. 7). Hence expired gases can be directed to the bag (by adjusting the valve) against the minimum of resistance. The bag normally offers no resistance, acting merely as a reservoir.

5. *Endotracheal adapters* are made of Perspex, and therefore extremely light (B in Fig. 7). The lumen of the adapter is greater than that of standard types for each age group, and connects the vertical limb of the device directly to the endotracheal tube (Fig. 12), dispensing with the need for curved or angled connexions.

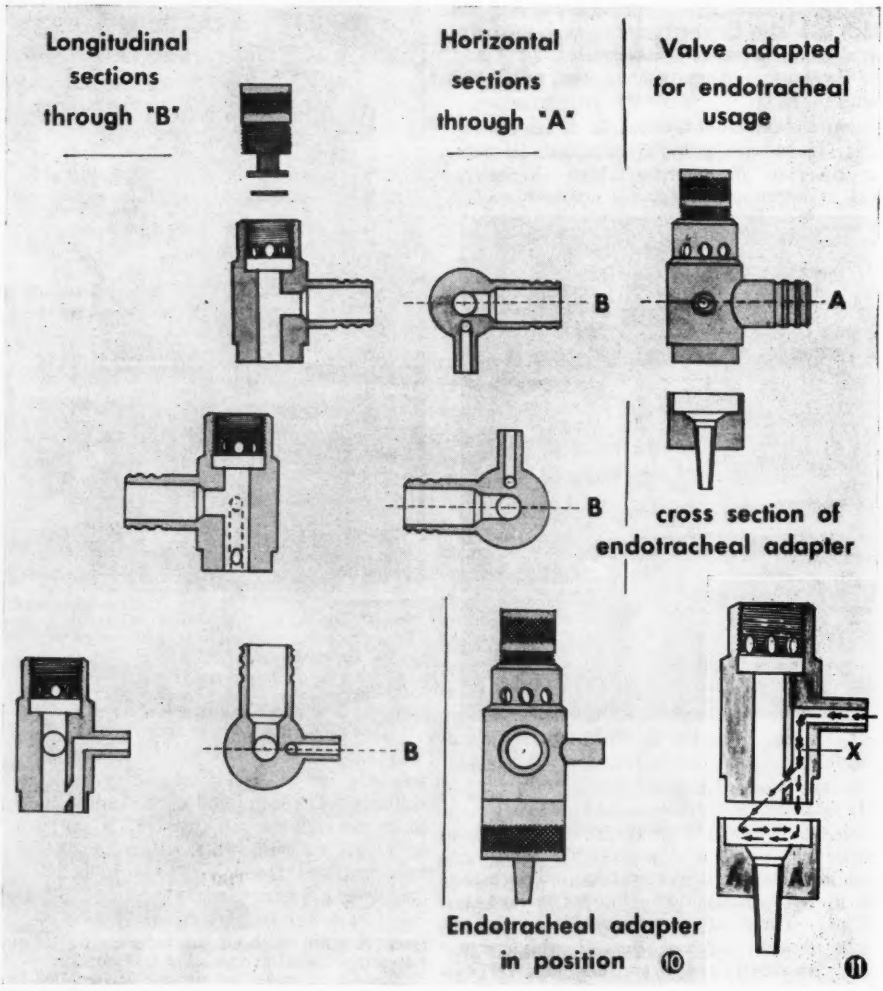


Fig. 10: Diagram of the device.
A: The inlet and the 2 outlets for the gases.

Fig. 11: The eddy of the gases.

The bowl of the adapter has been reduced in size so that it contains negligible dead space. Thus dead space and resistance have been reduced to a minimum. Six sizes of adapter are available: adult male and female, larger and smaller child, and larger and smaller infant. Each adapter is tapered to fit any size of tube for the age group.

The device is available in 3 sizes: infant, child and adult. The contrast with standard equipment is well seen when compared with the usual metal endotreacheal adapter (Fig. 13). The entire device in the infant is much smaller than the metal adapter alone. Its weight is less than $\frac{1}{3}$ oz., as compared with the weight of the standard adapter, which is 2 oz. Its small size is an obvious advantage in surgery of the face. The amount of dead space is negligible, being less than 0.5 c.c. for the infant, 1.25 c.c. for a child, and 2 c.c. for an adult. The small amount of dead space facilitates efficient working of the valve when an endotracheal adapter of small lumen is used.

THE DEVICE IN USE

This must be considered under two headings:

(*a*) When respiration is spontaneous; and
(*b*) When respiration is controlled.

A. SPONTANEOUS RESPIRATION

1. *In Infants.* Fig. 8 shows the device adapted to a face piece by a Perspex bush. The face piece is fitted with an additional valve (B in Fig. 8) so that the expired gases can escape promptly. This reduces the dead space in the face piece and incidentally avoids the resistance of the incoming gases.

For induction, the valve in the device is closed and that in the face piece is opened fully. The face piece is held away from the face at first. A substantial flow of gases is permitted to enter the face piece via the inlet in the device in which the expiratory valve is closed. The minute flow is based on the necessity to have an adequate amount of gases available whenever the infant inhales, and is determined by estimating the ventilatory excursion (e.g. 70 c.c. in a crying infant) and multiplying this by 60. In this example, the flow would be 4.2 litres. To allow for possible leakages, a flow of 4.5 litres would be advisable.

If a sudden increase in concentration is avoided by bringing the face piece steadily down, unconsciousness will rapidly ensue. There should be no undue struggling as occurs when the infant fights against a feeling of suffocation.

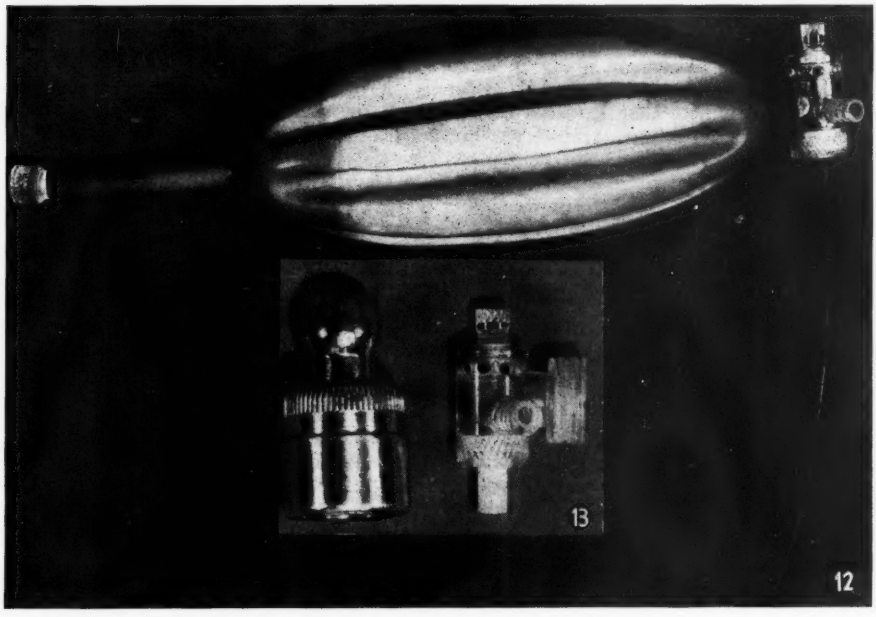


Fig. 12: The device fitted to an endotracheal tube by an adapter.
Fig. 13: The device compared for size to a standard endotracheal metal adapter.

With the onset of unconsciousness (i.e. coma), respiration becomes automatic and the tidal volume drops. At this stage, when the coma is not yet deep enough to abolish laryngeal reflexes, any stimulus (whether applied to the respiratory tract or elsewhere, e.g. the anus) may induce laryngeal spasm. Coupled with a high concentration of a toxic narcotic, the risk of cardiac arrest will be increased.

It is desirable therefore to ' settle ' the infant as soon as possible. This can easily be achieved by permitting a little re-breathing. The consequent increase of ventilation allows a greater amount of narcotic to be absorbed. *This is less dangerous than increasing the concentration.*

Since deep coma is undesirable, the depth of anaesthesia should be lightened after a few minutes. However, to prevent or treat laryngeal spasm, which is liable to occur in light anaesthesia, it is advisable to have a muscle relaxant at hand. The author relies on succinylcholine chloride, kept ready in a syringe. Its rapid and effective action make it invaluable as a stand-by.

2. *In Older Children and Adults.* Induction is usually performed by one of the basal methods. However, when a face piece is used, the co-operative patient is asked to breathe normally at say, 20 per minute. The minute flow is determined as follows: the valve in the face piece is opened widely, and an arbitrary flow of gases, say 12 litres per minute, is allowed to enter the device, in which the valve is completely closed. If the bag distends on expiration, the minute flow is excessive and should be reduced to a level at which the bag fills comfortably without distension. If the bag collapses on inspiration, the minute flow is inadequate and should be increased, so that there is a little gas in the bag after inspiration. *When the bag neither distends nor collapses, the system is in equilibrium.*

If the patient is uncooperative, the minute flow is determined as above for the crying infant.

Once coma is established, a flow of about 6–10 litres will suffice to meet the ventilatory requirements of an adult for maintenance. For children, the flow will be proportionally less. For adults, the valve can be opened almost fully during light anaesthesia. Sufficient re-breathing of CO_2 will restore the tidal volume (which falls inevitably with the onset of coma) to an adequate level, thus ensuring adequate intake of oxygen (if given), adequate intake of narcotic, adequate output of narcotic, and adequate output of CO_2.[4]

3. *Endotracheal Administration.* It is in endotracheal anaesthesia in infants and young children that the greatest difficulties are encountered, and it is precisely these difficulties that the new equipment most effectively overcomes. It is also most useful in adults, especially poor-risk cases.

After intubation, the device is connected directly to the endotreacheal tube by means of a Perspex adapter (Fig. 12). Retaining straps are unnecessary. The expiratory stream passes straight up the endotracheal tube and the vertical limb to the open valve. To maintain anaesthesia, since the patient is now at rest, about half the minute volume required for induction, will now suffice. The conduct of the anaesthetic will be found to be simplicity itself.

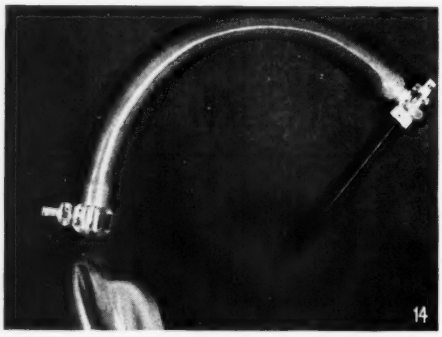


Fig. 14: The second valve near the bag separated from the device by tubing.

If the anaesthetist is not permitted to remain near enough to regulate the valve in the device, that valve is set, and a length of rubber or plastic tubing (e.g. Tycon) is interposed between the device and a second valve placed next to the bag (Fig. 14). In the case of an infant, tubing with a lumen of $\frac{3}{8}$ inch is used as shown. For children and adults, corrugated tubing about one foot long and with a lumen of about $\frac{3}{4}$ inch, will cause minimal resistance to the flow of gases. If there is a sudden need for the administration of oxygen or narcotic gases under pressure, the surgeon can be asked to close the valve in the device (which he can do through the sterile towels) and the valve near the bag can be regulated by the anaesthetist.

B. CONTROLLED RESPIRATION

It was pointed out above that one of the defects of standard equipment is the inevitable loss of fresh gases through the expiratory valve when the bag is compressed. This loss can be serious when anaesthesia is produced by nitrous

oxide alone. The fault lies mainly in the proximity of the inlet to the outlet (Fig. 15). In order to appreciate the beneficial effects which result from the correct use of the equipment, one must consider the flow of gases during the respiratory cycle.

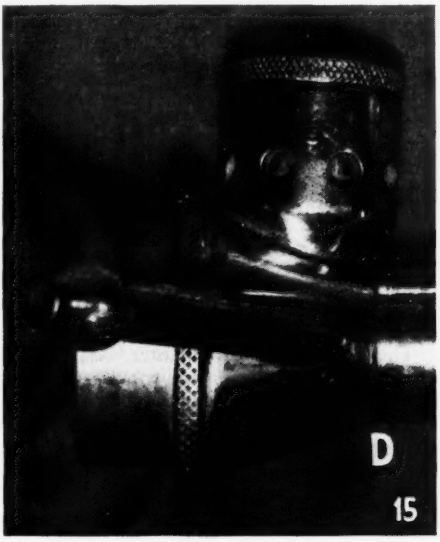


Fig. 15: Inlet and outlet in one unit (the Water's type).

The Flow of Gases. When a healthy subject breathes *naturally* under basal conditions, during sleep, it will be observed that the respiratory cycle has the following pattern. If the rate is 20 per minute, inspiration lasts about one second; expiration follows immediately and lasts also about one second; *then a pause ensues,* lasting also about one second (Fig. 16).

The pause is a definite entity. It appears to serve a definite function, viz. to allow CO_2 to accumulate in the blood to a level at which the respiratory centre is stimulated to invoke inspiration. This method of regulation may be complementary to the Hering-Breuer expiratory reflex.

The need for the pause is well demonstrated when a Ruben valve is used. This ingenious uni-directional valve allows gases to be inspired or pumped into the lungs, and then to escape into the ambient atmosphere. Suppose the tidal volume is 400 c.c. and respiration is to be controlled at 20 per minute; the minute flow is set at 8 litres. The machine then delivers, in one second, $8{,}000 \div 60 = 133.3$ c.c.

After 3 seconds, the bag will contain 400 c.c. and the cycle commences.

During the first second, the bag is compressed; 400 c.c. enter the lungs. During the same second, 133.3 c.c. of fresh gases enter the bag.

During the next second, expiration occurs. Another 133.3 c.c. enter the bag, which now contains 266.6 c.c.

During the pause, another 133.3 c.c. are added, bringing the total increment to the required 400 c.c., and the cycle recommences.

If the flow rate is constant, the pause is obviously essential if the tidal volume is to be maintained. If the pause is ignored, the minute flow must be increased to 12 litres if the tidal volume is to be kept at 400 c.c., and the rate of compression of the bag will be 30 per minute (B in Fig. 16), as the bag fills at the rate of 200 c.c. per second. The level of CO_2 in the blood will drop steadily, and the patient will be in danger of alkalosis. When an endotracheal tube is used, the dead space is reduced, removing a possible source of CO_2, and the danger of alkalosis will be intensified. The use of an absorber will obviously aggravate the danger.

To avoid excessive loss of fresh gases, the inlet must be separated from the outlet by tubing. The same length and calibre are used as for separation of the anaesthetist from the patient (Fig. 14). The site of inlet is preferably near the respiratory passage, whether into a face piece or an endotracheal tube.

It is wrong to allow the gases to enter from behind the bag, so that they flow to the patient via the bag and the corrugated tubing. This causes resistance to the expiratory stream, even when the valve is close to the respiratory passage. The expired gases are unable to escape through the valve (which must be virtually closed during controlled respiration) and take the line of least resistance, viz. towards the bag.

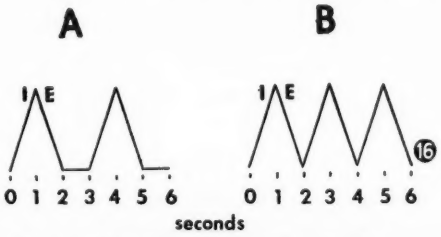


Fig. 16: The pause in the respiratory cycle.

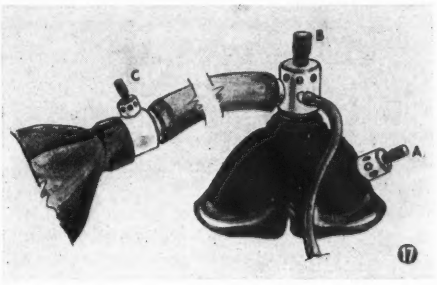


Fig. 17: The apparatus which is able to cope with the requirements of spontaneous or controlled respiration, and for anaesthesia via the face piece or endotracheal route.

In controlled respiration (Fig. 17), therefore, the apparatus is used as follows:

The valve in the face piece A is closed; the valve in the device B is closed; and a third valve C, placed between the interposed tubing and the bag, is used to regulate the escape of gases.

Assuming the flow with the semi-closed method is 8 litres per minute and the tidal volume is to be controlled at 400 c.c., the cycle will be as follows:

When the bag is sufficiently full, it is compressed. The gases pass along the interposed tubing, tending to drive before them 133.3 c.c. of fresh gases which have entered the device and occupy the face piece or the tubing. The valve C (Fig. 17) is set so that when the system is in equilibrium, 400 c.c. escape from the bag, of which 133.3 c.c. are expelled through the valve. The patient receives 133.3 c.c. of fresh gases, plus 266.6 c.c. of mixed gases.

During the next second, exhalation occurs. The expired gases traverse the tubing and fill the bag. During the same second, another 133.3 c.c. of fresh gases enter and mix with the expired gases. The slight rise of pressure in the system is sufficient to lift the valve disc and allow 133.3 c.c. of mixed gases to be expelled.

During the third second (the pause), another 133.3 c.c. of fresh gases enter and occupy the tubing, tending to displace the contaminated gases towards the bag, and causing another 133.3 c.c. of mixed gases to be expelled.

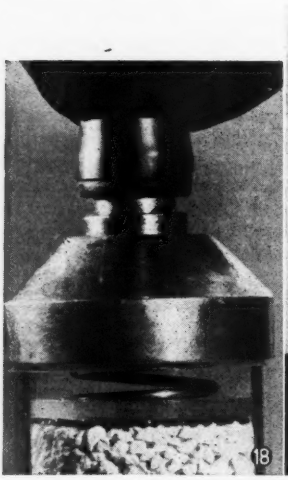
When the cycle recommences, the bag is compressed. The patient receives 133.3 c.c. of fresh gases from the inlet; 133.3 c.c. of slightly contaminated gases from the tubing; and 133.3 c.c. of more contaminated gases from the bag.

The net result in practice is that the patient gets the maximum amount of available fresh gases and is satisfactorily air-conditioned.

DEFECTS IN CO_2 ABSORBERS USED IN THE SEMI-CLOSED METHOD

The high cost of Cyclopropane and Halothane has led to an increase in the use of absorbers. In trying to economize, one may be tempted to increase re-breathing to an unwise degree. The absorbent granules become rapidly and excessively hot when the flow rate is cut down to one litre or less in a to-and-fro system. The humidity and the temperature of the inspired gases rise and upset the post-operative well-being of the patient.

The original Waters' canister, designed for to-and-fro absorption, is still popular. It has a capacity of about 450 c.c. and contains about 1 lb. of granules. The capacity seems arbitrary and may be related to the tidal volume of a



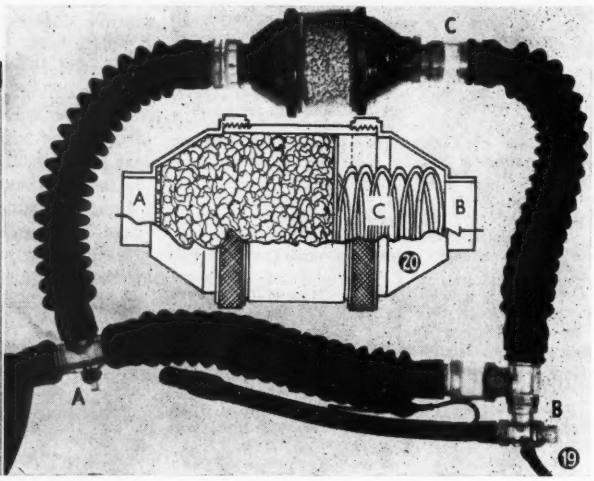


Fig. 18: Granules correctly packed by means of a movable filter and spring.

Fig. 19: The circle system.
A: Valve in T-piece housing bag.
B: The device.
C: Uni-directional valve.

Fig. 20: Diagram of canister.
A: The mouth of the canister.
B: The attachment for the bag (to-and-fro), or tubing for circle system.
C: The spring compressing the movable filter.

large adult. The drawbacks of this canister are:

(*a*) It is difficult to fill without crushing the granules. If under-filled, canalization is liable; if over-filled, the powder increases resistance.

(*b*) There is excessive dead space between the mouth of the canister and the adapter, a serious factor during spontaneous respiration, especially in the poor risk patient.

(*c*) A pound of granules can deal effectively with CO_2 for several hours.

As most operations last 1 to 1½ hours, there is a temptation to use the canister for more than one patient before refilling. Large 'economy size' canisters are advocated for the circle system, and are being used in large teaching hospitals abroad. Some of these canisters contain as much as 3 or 4 lb. of absorbent granules, and are advertised as being effective for as long as 20 hours of continuous use. Published papers contain scientific data purporting to prove that the bigger the absorber, the more effective it is. Furthermore, the canister is believed to destroy bacteria. This may be true of the less pathogenic organisms, but the author knows of a case where a virulent organism from a patient who underwent a septic lung operation infected subsequent patients using the same canister. The author would certainly jib at being second or lower in a series of patients to breathe through such a canister, and would object equally strenuously to subjecting his patients to this unhygienic practice.

Canisters in general, especially large ones, are a source of heat and resistance, as well as being cumbersome and unhygienic. When used in a to-and-fro system, they are particularly unwieldy. They tend, further, to become clogged by condensed water vapour, especially when incorrectly placed, as they often are, on the expiratory side of a circle system. In addition, they are often used in conjunction with yards of corrugated tubing, which causes further resistance.

Finally, a canister is very often the main cause of serious after effects in very young patients, on whom it should not be used.

INNOVATIONS SUGGESTED TO OVERCOME DEFECTS IN STANDARD EQUIPMENT

These are discussed under the headings:

(1) Resistance;
(2) Dead space;
(3) Pressure trauma;
(4) Hygiene;
(5) Air-conditioning.

1. *Resistance.* The author recommends a small canister containing 5–6 oz. of absorbent granules. If evenly compressed by means of a spring and movable filter[5] (Fig. 18), crushing and powdering and consequent resistance are prevented. The resistance to the tidal volume of an adult is as low as 0.3 c.c. of water when the canister is used in a to-and-fro unit. When placed in a circle system (Fig. 19) with the minimal amount of tubing, the resistance is increased to 0.4 c.c. of water.

2. *Dead Space.* One of the features of the author's improved absorber is the reduction of dead space to a minimum, as the granules are packed well into the mouth of the screw-in head (Fig. 20).

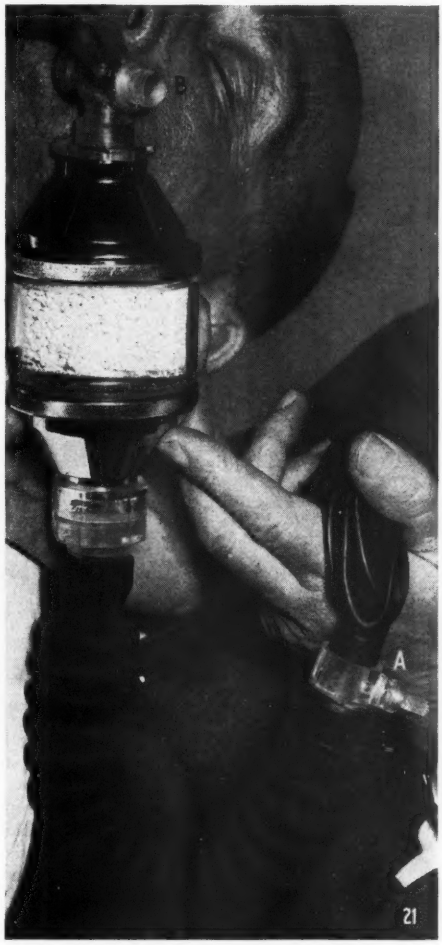


Fig. 21: Small canister in to-and-fro system.
A: Expiratory valve near bag.
B: The inlet entering the device.

3. *Pressure Trauma.* The canister is small and light. If the patient's head is turned slightly to one side, the canister rests on the pillow.

4. *Hygiene.* No patient should be required to breathe through a canister which has not been cleaned after use and filled with fresh granules. The canister should be washed after each use, and boiled or autoclaved after an infectious case. The Perspex can tolerate the necessary heat.

5. *Air-conditioning.* The fresh gases should not pass through the canister, whether respiration is spontaneous or controlled. They should enter through the device (Fig. 21).

When respiration is spontaneous, the expired gases should be expelled either through the valve in the device, or through a valve in the face piece.

When respiration is controlled, and the canister is used in a to-and-fro unit, the expelled gases pass out through the valve situated between the canister and the bag (A in Fig. 21). In the circle system, the valve is included in the T-piece which holds the bag (Fig. 17).

To prevent undue heating and humidity of the inspired gases, the author recommends that the minute volume in adults should not be reduced to less than 3–4 litres when the canister is used in a to-and-fro unit, or less than 1.5–2 litres in the circle system. It is much wiser to economize less, in the interests of safety. Nitrous oxide is an inexpensive narcotic which

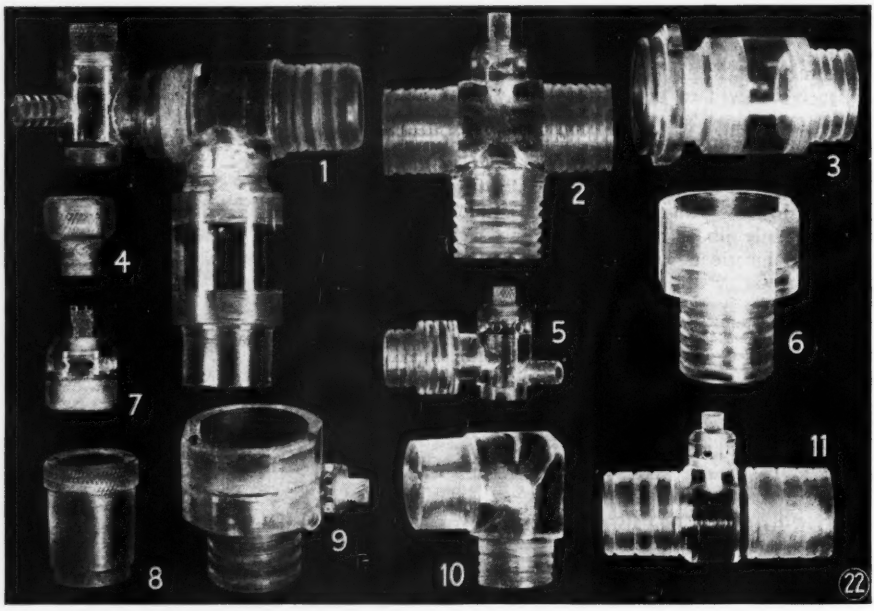


Fig. 22: *Perspex accessories designed and made by the author:*

1. Adult size device in the connexion housing the uni-directional valve for a circle system.
2. T-piece with expiratory valve for a circle system.
3. Uni-directional valve in adapter for canister.
4. Endotracheal adapter for device.
5. The children's device. Note bag mount able to take different sizes of bags.
6. Adapter for bag and canister, or tubing and canister.
7. Expiratory valve with screw-in bush for face piece.
8. Bush to connect device to face piece.
9. Canister adapter with expiratory valve and outlet to pressure gauge for estimating tidal volumes.
10. Angled piece which connects bag to face piece with expiratory valve.
The angle piece has a separate inlet for the gases which pass down the wall of one of the limbs and not into the lumen of the limb.
11. Expiratory valve in the connexion for tubing and re-breathing bag.

is a useful synergist and a convenient diluent for all other narcotics.

If the canister is changed as soon as it becomes appreciably warm, the well-being of the patient will not be jeopardized by the heat and the excessive humidity of the inspired gases.

DISCUSSION

A well-conducted anaesthetic resembles a successful aeroplane flight. Just as the pilot and passengers depend on sound performance on the part of the aeroplane, so the anaesthetist and his patient depend on sound performance on the part of the anaesthetic equipment.

That equipment should ensure the maximum of safety at every stage in the anaesthetic—during induction (the take-off of the plane); during the settling of the patient (the climb to a safe altitude); during maintenance (steady flight at cruising speed); and during recovery (the landing). Each stage has its perils, and only by familiarity and confidence in reliable equipment can maximum safety be achieved.

Anaesthetic equipment hitherto in use appears to have been designed on an anatomical basis to suit the physiological requirements of a healthy, conscious subject. It does not cater for the sick, unconscious patient who cannot fend for himself. It fails to offer a compromise between dead space and resistance, or between the requirements of patients of different age groups. In fact, the equipment made by leading manufacturers is so constructed that the parts made by firm 'A' fit those made by firm 'B,' with little regard for undesirable dead space. For instance, the endotracheal adapter made by firm 'A' is the female component of the connexion, but may be used as the male component of the connexion made by firm 'B.' This may lower production costs, but is unrelated to the needs of the patient.

The author has achieved a compromise between dead space and resistance *for each age group,* and *for each stage of anaesthesia.* For instance, during induction in an adult, with a face piece, larger volumes are respired than during maintenance. The lumen of the valve has been made intermediate in size between that which is optimal for the 2 stages. As induction is the shorter stage, the lumen approximates more to that desirable for maintenance.

Again, in the new-born infant, the tidal volume is as low as 16–20 c.c. It is obvious that dead space and resistance must be pruned to the barest minima, and the endotracheal adapters have been designed accordingly. It has been possible to increase the lumen at the expense of the thickness of the wall without weakening the structure, because of the properties of Perspex. This is not possible with metal, which is easily distorted when thin. (The great variety of the uses to which Perspex can be put in anaesthetic practice is shown in Fig. 22, which illustrates accessory parts and the device designed and made by the author).

The sizes of the apertures in the device have been related to the size of the subject's trachea, viz. 3 mm. at birth, plus 1 mm. more per annum until adult size is reached: 16–20 mm. in the male and 12–16 mm. in the female.

The Comfort of the Patient. The findings on which the author has based his recommendations on hygiene, air-conditioning and pressure trauma are the result of personal experimentation by the author on himself, and can be easily verified by the reader.

Perspex. Perspex is ideal for the manufacture of anaesthetic equipment. It is extremely light, resilient, harder than wood and more durable than most metals. It lends itself to air-tight connexions. The Perspex used is not the 'extruded' plastic, which is inferior and does not withstand heat. It is unplasticized, solid, acrylic Perspex which can be sterilized by boiling or autoclaving without loss of shape and is unaffected by the vapours of chloroform, trichlorethylene or halothane in the usual concentrations.

I wish to thank my colleague Mr. M. Arnold, F.R.C.S., for his loyal co-operation over many years in our joint endeavours to improve the lot of the unfortunate patient, and for his help in the preparation of this article; Union Plastics, for their generosity in allowing me the use of their up-to-date factory and equipment to design and make the new equipment; the Medicine Department of the University of the Witwatersrand for the excellent photographs; and my wife, for her effective drawings and her patient forbearance during the trying period when the improved equipment was designed and made.

I also wish to thank my colleagues for advice and interest shown.

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MEDICO-LEGAL SECTION

'THE SPUR OF THE MOMENT': AN EXTENUATING CIRCUMSTANCE

R. v. MLAMBO

(WITWATERSRAND LOCAL DIVISION)

1959. *November* 19. 1960. *January* 13. THERON, J.

Criminal law.—Murder.—Extenuating circumstances.—What constitute.—Accused initially probably not having intent to kill.—Accused on spur of moment recklessly stabbing in vital part.

On a charge of murder the evidence disclosed that while one person barred the way of the deceased the accused had come up from behind and stabbed him in the chest with a knife, towards the back, inflicting a 3½ inch deep wound in a vital part of the body. The Court found that any reasonable person in his sound and sober senses, as the accused was, must have realized that the not only reasonable but most probable consequence was that the deceased would be killed.

Held, that the accused had wrongfully and unlawfully and maliciously killed and murdered the deceased.

Held, further, as the accused had probably not intended to kill but on the spur of the moment had recklessly done what he did, that this constituted an extenuating circumstance upon the particular facts of this case.

Criminal trial on a charge of murder. The facts appear from the reasons for judgment.

E. Tucker, for the Crown.

K. G. Rasmussen, for the accused, at the request of the Court.

Cur. adv. vult.

Postea (January 13th).

THERON, J.: It is alleged that on the 29th of January, 1959, at or near Jeppe in the district of Johannesburg the accused maliciously killed and murdered a native by the name of John Mabaso.

On the evidence before me it has been proved beyond all reasonable doubt that John Mabaso was stabbed to death at Jeppe on the late afternoon of the 29th of January, 1959. His body was found to have upon it a stab wound inflicted from behind. This stab wound was in the chest towards the back. According to the medical evidence this stab wound was in the seventh intercostal space at the back. It was a 3½ inch deep stab wound. That was the only injury he sustained. Two witnesses called by the Crown identified the accused as the person who inflicted this wound, the first witness being a native girl by the name of Esther Hlatwayo, a vendor of cooked foods which she sells in the vicinity. The second witness was a certain Johnson Sibiya, a night watchman at a store in that vicinity. The accused admits knowing Esther Hlatwayo well. He admitted that on some occasion he bought goods from her. Esther told the Court that she knew the accused for a considerable time and knew him very well. He too is a person who goes about in that area selling meat. Johnson told the Court that he too knew the accused for some time past. He has on occasions seen him selling head and trotters in that vicinity and he says he knew him very well. Both these witnesses told the Court that they saw the stabbing take place. They both identified the accused as the person who did the stabbing. There is some measure of discrepancy between the evidence of Johnson and Esther about how the stabbing took place. I am satisfied on the evidence of Esther that she was a cautious and careful witness, but no doubt a witness who may well reconstruct things that may have not been clear to her on the day in question. As a human being she may also err. She may err about incidents that took place. I am, however, satisfied that she was within sight of the scene where the stabbing took place and immediately the deceased fell to the ground she went there and was there before Johnson even arrived at the scene. She says she saw the stabbing, she saw the man falling. Her action in going up to the deceased man where he was lying immediately thereafter is consistent with her having seen a stabbing taking place. I am not able to say the same about Johnson. His evidence

was not as convincing as that of Esther Hlatwayo. I have it present to my mind that he, Johnson, immediately on arriving at the scene imputed blame to the accused by referring to him as the man selling offal. The accused denied being present in the vicinity; Esther described him being present, that he did do the stabbing, and that he was in the company of a certain witness who was called to-day, Isaac Skosana, alias Badman. Isaac to-day also denied under oath that he was there on the day in question and he denied that he on any occasion irrespective of this day associated with the accused in any manner. I disbelieve Isaac in that regard because on the accused own's admission he and Isaac drank together at least on one occasion. Isaac was over eager to avoid the 29th, a day that he has no recollection about to-day, suggesting that he was with his mother when he has no recollection of the day at all. A truthful witness would open-heartedly say to the Court that " it is so long ago I cannot remember the 29th ", and no person can expect him to remember it. His suggestion that he went to see his mother every morning at her place of employment is a very lame one. I disbelieve his evidence in so far as his association with the accused is concerned.

The question is—has the Crown proved beyond all reasonable doubt that the accused was there and that Badman was there and that the accused did the stabbing according to the evidence? I accept the evidence of Esther that she saw a stabbing, immediately the injured man fell to the ground she went up to him and Johnson came there very soon afterwards, both of them identifying the accused as the person who did the stabbing. There is always the human element that one must guard against that a person may wrongly identify another although being certain that he is that person. Esther impressed me as a person who would not lightly point out a person unless she has that measure of certainty in her own mind that she was satisfied that he was the person. That in itself may not be sufficient. I therefore have to consider the other evidence to see whether her identification is reliable. I accept the evidence of Blouses Hlatwayo that he was with Esther on an occasion at a place where the accused was present; I accept the evidence of Esther and Blouses that Esther there pointed to the accused drawing Blouses' attention to him, and I accept the evidence of Blouses that because of that fact the accused then mingled with others and made his disappearance. I accept the evidence of Blouses that thereafter in consequence of that pointing out he went to search for the accused and found him. I also accept the evidence that upon the accused seeing Blouses he ran away, and Blouses pursued him, that Blouses then sought the assistance of Constable Oberholzer to effect the arrest of the accused. There are two issues: Blouses says that the accused ran away because he, the accused, saw him coming to effect his arrest knowing that he, the accused, was pointed out to Blouses previously by Esther. Blouses says that while he was so pursuing the accused he found the policeman who assisted him to effect the arrest. The accused gave the following explanation: He stated that Blouses together with four others armed with sticks came up to him and struck him, that he and a friend of his then ran away, that Blouses and his friends pursued him still armed with the sticks, in fear of being further assaulted he ran away and hid behind a hedge where he was arrested by the police. When the police arrested him the accused did not make any allegation against Blouses of this assault. He was then detained on the present allegation of murder of the deceased and he made no comment about the conduct of Blouses at all. His counsel was constrained to admit that his evidence in regard to this pursuit by Blouses and the reason for his running away was not satisfactory. I go further and I say I reject it as false. I accept the evidence of Blouses that he was not in the company of others, I accept his evidence that he went there in order to arrest the accused because Esther previously pointed him out to Blouses. The next question is why should the accused run away having previously seen Esther pointing him out to Blouses? The mere fact that a person points out another and thereafter that other person approaches the person pointed out would be no reason for an innocent man to run away. His reason for running away is false and therefore on analysis I find that the evidence of Esther is true that she pointed him out to Blouses and I accept the evidence of Blouses that he in consequence of that pointing out endeavoured to arrest the accused. The only inference to be drawn then is that the accused knew that Esther was in the vicinity where the stabbing took place, that he knew because he was in that vicinity the day when the stabbing took place and he knew that the stabbing did take place: that he knew because he did the stabbing. So when Esther pointed him out to Blouses, he immediately knew why it was and he made his disappearance. Subsequently when Blouses came to arrest him he tried to escape. I am there-

fore not concerned to analyse the discrepancy between Esther and Johnson meticulously. I am satisfied on all the evidence that the Crown has proved beyond all reasonable doubt that the accused did the stabbing on that day. There is no evidence of any premeditation, there is no evidence that he had a prior design to attack the deceased and kill him and, therefore, on a subjective test the Crown has not proved that he intended before he committed this stabbing to kill the deceased. He was armed with a knife. When he opened that knife—if it was a clasp knife—is not proved by the evidence, but on the evidence of Esther it seems very strongly indicative of an intended robbery that was attempted by him and the other native by stopping persons or barring their progress in the road, but that has not been proved, it is merely suggested on the evidence because of their conduct as proved by Esther. What I do find as proved beyond all doubt is that one person barred the way of the deceased and the accused came up from behind and stabbed him. By stabbing him with a knife of the dimension that Esther has described, and I find no reason to find fault therewith, he inflicted a 3½ inch deep wound in a vital part of the body of the deceased. It is therefore clear that he was entirely reckless of the consequences of his wielding this lethal weapon. Any reasonable person in his sound and sober senses, as the accused was on that day, must have realised that when using a knife and stabbing the deceased in so vital a part of his body, the not only reasonable but most probable consequence would be that he would be killed. Now that is the intention to kill, and I therefore find that the accused wrongfully and unlawfully and maliciously killed and murdered the deceased.

It is not necessary to hear Mr. *Rasmussen* in regard to extenuation. It seems to me this is the type of case wherein I could extend as far as humanly possible in favour of the accused what can be termed to be extenuating circumstances. I find on the facts of this case that although not detracting from the blameworthiness it is an extenuation that he together with another probably did not intend to kill but on the spur of the moment recklessly did what he did and if that were to be held murder without extenuating circumstances probably a large number of people of these races will be found facing the ultimate penalty. I felt it is a generous approach in his favour, but I am upon the particular facts of this case extending it as far as I humanly can to find that that is an extenuating circumstance in his case.

NOTES AND NEWS : BERIGTE

Prof. J. H. Louw, Professor of Surgery at the University of Cape Town, has been elected a Fellow of the Royal College of Surgeons of England.

Professor Louw was admitted to the Fellowship in person in London on 14 July.

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THIRD WORLD CONGRESS ON THE PREVENTION OF OCCUPATIONAL RISKS

The National Safety Institute of France is organizing this Congress in collaboration with the Committee on the Prevention of Occupational Risks of the International Social Security Association (I.S.S.A.), and in co-operation with the International Labour Office.

Those interested should apply to:
Institut National de Sécurité,
Secretariat du III° Congrès mondial,
9 Avenue Montaigne,
Paris-8e, France.

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FACULTY OF MEDICINE: UNIVERSITY OF NATAL

BURROUGHS WELLCOME PRIZE 1959

Each year the Burroughs Wellcome Prize of £50 is awarded to the best qualifying medical student in the University of Natal.

The Board of the Faculty of Medicine announce that the Prize for 1959 has been awarded to Dr. P. L. Patel.

ROCHE PRODUCTS APPOINT A MEDICAL AND SCIENTIFIC ADVISER

Roche Products, Johannesburg, in announcing the appointment of Dr. W. Leigh as Medical and Scientific Adviser to their Company, state:

Dr. Leigh matriculated in South Africa. He later studied medicine at the University of the Witwatersrand and graduated as an M.B., Ch.B., obtaining first-class honours, *inter alia*, in pharmacology. He completed his medical and surgical housemanship at the General Hospital, Johannesburg. Thereafter he was associated with the Transvaal Chamber of Mines in experimental clinical work on the uranium workers at the Cottesloe Hospital.

Whilst in private medical practice he served on the panel of medical operators of the South African Blood Transfusion Service for some time. At a later stage Dr. Leigh accepted a Union Health Department appointment, which he held until he joined the Roche Company.

The closest liaison between the medical profession and the pharmaceutical houses has become a necessity due to the great scientific developments which have taken place and Roche therefore felt that the appointment of a registered medical practitioner (a long-established practice in the United Kingdom, Europe and the United States) would be essential.

Dr. Leigh's activities will consist mainly of the planning and institution of clinical trials on Roche preparations which are as yet in the research stage. The Union is in many ways uniquely placed for this

type of scientific work; firstly, on account of its climate and geographical position (e.g. when it concerns the therapy of parasitological disorders), and secondly, on account of its excellent universities, hospital system and the great number of exceptional medical scientists who have gathered for work in our country.

Another facet of Dr. Leigh's activity will be the detailed study of the clinical aspects and the pharmacology of Roche preparations. This will put him in a position to give scientific information and advice which may be required.

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THE NATIONAL CANCER ASSOCIATION OF SOUTH AFRICA

PROCEDURE IN REGARD TO THE SUBMISSION OF SPECIMENS TO THE TUMOUR REFERENCE PANEL

1. The National Cancer Association Tumour Reference Panel consists of experts in pathology from different centres in the Union. Members of the Panel act in an honorary capacity and no fee is charged for their services.

2. It will be the function of the Panel to investigate the histological nature of a tumour in cases where difficulty or doubt exists about the exact diagnosis. Specimens for investigation will only be considered by the Panel when forwarded through the original reporting pathologist. The Panel will in no circumstances examine a specimen which has not previously been submitted to a pathologist.

3. Any practitioner who requires an opinion from the panel in doubtful cases must request the pathologist employed by him to forward clinical particulars, original blocks of sections and the specimen (if still available) to the National Secretary, National Cancer Association of South Africa, P.O. Box 2000, Johannesburg.

4. The details of the case will be sent by the National Secretary, National Cancer Association, to the Tumour Reference Panel, and the opinion of the Panel will be forwarded (as soon as it has been received by him) to the original reporting pathologist and to the practitioner concerned.

5. Liaison has been established with the Tumour Reference Panels of World Health Organization as well as other overseas expert panels, and if the South African Reference Panel considers it necessary, cases of particular interest or of unusual difficulty will be referred overseas.

6. All correspondence concerning the Tumour Reference Panel must be directed to the National Secretary, National Cancer Association of South Africa, P.O. Box 2000, Johannesburg.

PREPARATIONS AND APPLIANCES

DIHYDROTHENAT: DETOXICATED DIHYDROSTREPTOMYCIN PANTOTHENATE

Noristan Laboratories announce a new product, a detoxicated dihydrostreptomycin preparation, *Didrothenat*. It is a mixture of dihydrostreptomycin sulphate (80%) and dihydrostreptomycin pantothenate (20%). The preparation has been developed in the research laboratories of Messrs. Chemie Gruenenthal GmbH. Stolberg/Rhineland in an effort to eliminate the toxic after-effects of streptomycin and dihydrostreptomycin which have so far sharply restricted the therapeutic use of these substances.

Extensive animal experiments followed by clinical trials over years have proved this combination to be therapeutically fully effective and yet practically free from the dreaded neurotoxic effects. The detoxication is ascribed to the new pantothenic acid compound, the so-called pantothenate of dihydrostreptomycin which prevents occurrence of irreparable deafness even after prolonged treatment. It has been conclusively reported by clinical investigators that a content of 20% of dihydrostreptomycin pantothenate mixed with 80% dihydrostreptomycin sulphate is sufficient to provide full protection and that *Didrothenat* is safe to use.

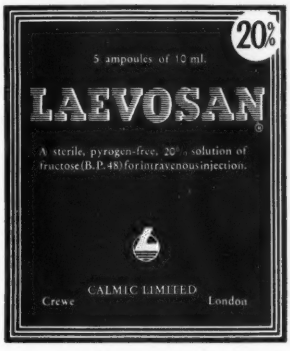
Didrothenat is available in vials, containing the equivalent of 1 g. dihydrostreptomycin (base).

Information and literature can be obtained from the sole distributors in the Union of South Africa, Noristan Laboratories (Pty.) Ltd., P.O. Box 78, Silverton, Tvl.

LAEVOSAN

Westdene Products (Pty.) Ltd. announce the introduction of *Laevosan* from Calmic of England.

Laevosan is a 20% solution of laevulose (fructose) presented in ampoule form for intravenous injection. Laevulose has many advantages over glucose as a carbohydrate supportive therapy in conditions of metabolic stress. Owing to new and more economical methods of processing, this useful carbohydrate is now available for general clinical use.



Laevulose enters the energy releasing system more directly than glucose and is metabolized independently of insulin. Where the liver synthesizes only 12% of glycogen from glucose, it synthesizes 35% to 40% from laevulose. Furthermore, the severely damaged liver is still capable of utilizing laevulose when it can no longer utilize glucose.

Laevosan has a protein-sparing action in cases of traumatic shock or severe infection. It is also indicated for acute and chronic hepatitis, toxaemias of pregnancy, irradiation sickness, etc. High concentrations may be injected with little risk of vein damage.

Laevosan is available as a sterile pyrogen-free solution containing 20% laevulose. It is supplied in boxes containing five 10 c.c. ampoules. Further details may be obtained from the sole South African distributors, Westdene Products (Pty.) Ltd., P.O. Box 7710, Johannesburg. (*Telephone*: 23-0314).

TENUATE

NEW ADVANCE IN WEIGHT CONTROL

Mer-National Laboratories announced the release in South Africa of *Tenuate*, a new appetite suppressant for the treatment of obese and overweight patients.

Pharmacology: *Tenuate* (diethylpropion) has a distinctive chemical structure which provides a direct central anorectic action. *Tenuate* is believed to activate the satiety centre in the hypothalamus on a more specific and discriminate basis than drugs of the amphetamine group.

Advantages: *Tenuate* is a pure anorectic, it effectively suppresses appetite with virtually no central stimulation. Clinical studies have shown no demonstrable effect upon heart rate, blood pressure, blood sugar, urine glucose, pulse or respiration. *Tenuate* avoids the side effects of stimulating anorectics—insomnia, nervousness, jitters, irritability, euphoria and post-medication let down. It is recommended for the cardiac-hypertensive obese, diabetic obese, and for obesity in gynaecology. Clinical studies in these patients have revealed no alteration in blood pressure, ECG patterns, carbohydrate metabolism or blood count.

In addition to special risk cases, *Tenuate* is the ideal anorectic in all obese and overweight patients. Lack of CNS stimulation permits administration of late-evening doses to control night-time hunger. A more complete suppression of appetite may therefore be obtained, with consistent and progressive weight loss. Clinical evidence reports prompt, predictable hunger control and satisfactory weight loss in 88% of patients on *Tenuate* therapy, without special low calorie diet restrictions.

Tenuate is especially suitable for long-term anorectic use. There has been no reported tolerance, habituation or addiction to *Tenuate*.

Side Effects: Tenuate is safe and causes virtually no side effects to prevent its use. The only side effects reported to date are an occasional constipation (probably due to reduced food intake), and slight thirst and dryness of the mouth. In one series of 266 cases, only one patient reported wakefulness on regular administration of *Tenuate* at 8 p.m.

Indications: The overweight and obese patient, including adolescent, geriatric and gravid as well as special risk situations—cardiac, hypertensive and diabetic.

Dosage: One 25 mg. tablet, one hour before each main meal. An additional tablet in mid-evening will control night-time hunger without loss of sleep.

Supplied: Bottles of 25 mg. tablets, 30's retail 10s. 6d.; 100's retail 31s.

Manufactured under the control of the Wm. S. Merrell Company, Cincinnati, U.S.A.

Marketed in South Africa by: Mer-National Laboratories (Pty.) Ltd., P.O. Box 6742, Johannesburg.

Distributed by: Westdene Products (Pty.) Ltd., P.O. Box 7710, Johannesburg.

DUVADILAN

FOR OUT-PATIENT MANAGEMENT OF PERIPHERAL VASCULAR DISEASE

South African Druggists Limited are shortly to introduce *Duvadilan* (isoxsuprine HCl, a p-oxy-ephedrine derivative) manufactured under licence from Philips-Duphar of Amsterdam, by the Lennon Limited Laboratories at Port Elizabeth. This product has been used overseas since 1955.

Composition. *Duvadilan* is 1-(p-hydroxy-phenyl)-2-(1′-methyl-2′ phenoxyethylamino) propanol-hydrochloride. It is a synthetic compound related to ephedrine and adrenaline.

Mode of Action. *Duvadilan* acts directly as a smooth muscle relaxant, with selectivity of action on blood vessels, uterus and bronchial musculature. Vasodilation is *not* achieved through adrenergic blockade.

Indications. *Duvadilan* has been extensively shown to be an 'excellent', 'highly effective', 'valuable' and 'even striking' vasodilator without distressing side effects (hypotension, tachychardia) when correctly administered. It is suggested that *Duvadilan* will be 'well suited to out-patient and office management of peripheral vascular disease'.

Duvadilan has proved to be an effective vasodilator in cases that have shown no improvement on other vasodilator therapy. A report on 3 cases of gangrene which have been cured, is worthy of note.

'Dramatic results' have also been obtained with *Duvadilan* in its role as a myometrial relaxant.

Dosage and Side Effects: *Duvadilan* may be given both orally and parenterally, and it has been found useful to start treatment by giving intramuscular injections and tablets simultaneously and, later on, withdrawing the injections and maintaining the patient on tablets. Thus a combination of one ampoule every other day (10 mg.) and 2–4 tablets (20–40 mg.) daily has proved to be an effective schedule to start with.

It is frequently emphasized in the literature that, when administered as recommended, there are no distressing side effects to *Duvadilan* therapy. So-called 'palpitations', when encountered, have proved to be manifestations of increased cardiac output (stroke) rather than tachycardia.

Packings: Ampoules 2 c.c. with 10 mg. Boxes of 6. Tablets with 10 mg. Bottles of 100 and 500.

Further information and samples for clinical evaluation may be had from Ethical Promotion Section, South African Druggists Limited, P.O. Box 5644, Johannesburg, or upon request to any wholesale Branch of the Company.